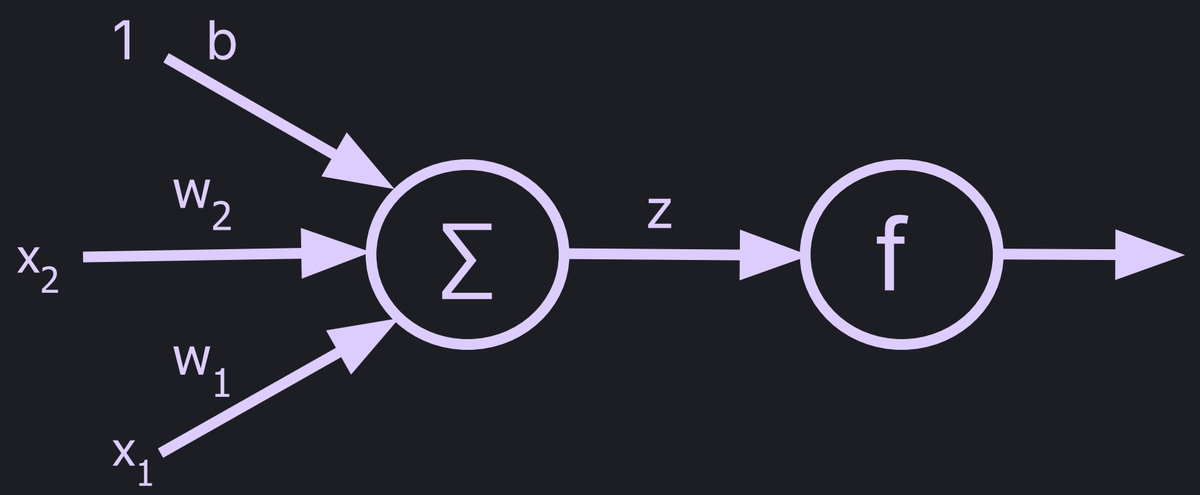
Perceptron

What is perceptron ?

It is an algorithm

It is used for supervised machine learning

We can see perceptron as a mathematical model/function



$Z = w_1x_1 + w_2x_2 + b$

Activation function converts output(z) in a particular range

In simple words activation function interprets the result(z)

Some examples of activation function are -

1. Step-function
2. ReLU
3. Tanh
4. Sigmoid

How does perceptron work ?

Perceptron has 2 stages - training and prediction

In training we try to find the best values of weights and bias

Say we have student with IQ 100 and CGPA 8 and lets say after training our perceptron we got weights as w1, w2 and bias b.

$$Z = 100w_1 + 8w_2 + b$$

This z will be sent to the activation function and activation function will decide whether this student will be placed or not.

Say we have a step-function as an activation function

Therefore if Z>=0 output will be 1 and output will be 0 otherwise.

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How to train perceptron ?

Training a perceptron means finding the best values of weights and bias for given data

Loss function - it tells us how good our predicted parameters are on given data

x1	x2	y
x11	x12	y1
x21	x22	y2

≈

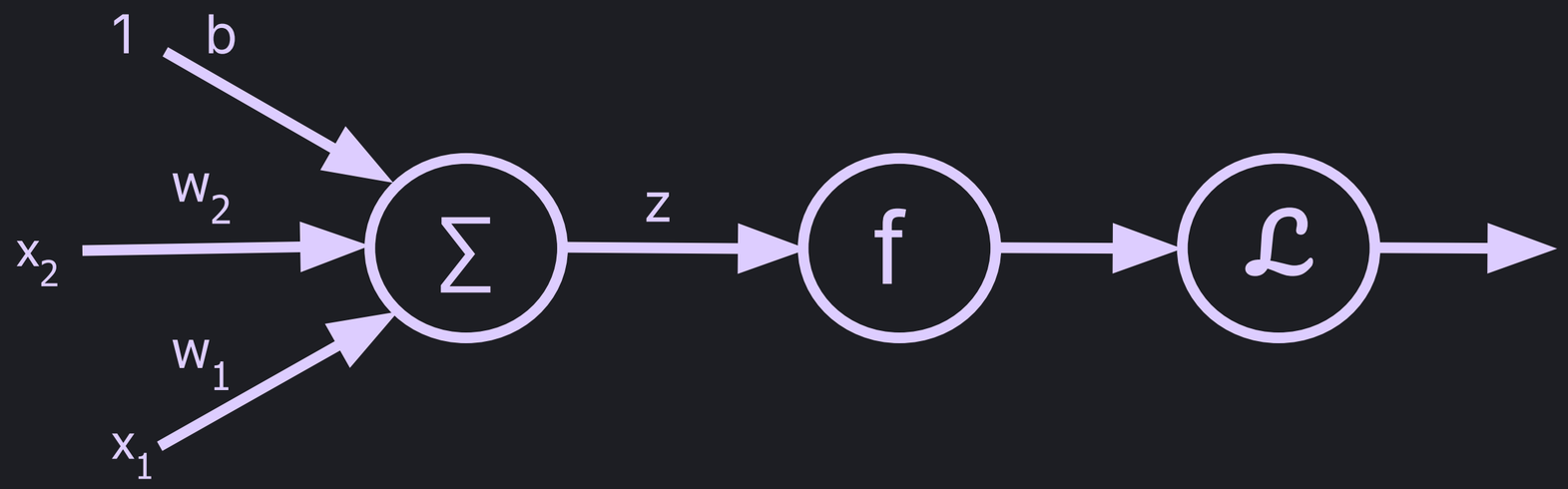
IQ	CGPA	Placed
100	7	1
60	5	0

$$L = \frac{1}{n}\sum \max\left(0, -y_i f\left(x_i\right)\right)$$

$$f\left(x_i\right) = W_1 X_{i1} + W_2 X_{i2} + b$$

We have to minimize the loss by changing the values of parameters that are weights and bias

We use gradient descent algorithm to find weights such that loss is minimum - Click Here



Loss Function	Activation function	Output
Hinge Loss	Step function	perceptron - binary classifier
log-loss(binary cross entropy)	sigmoid	Logistic regression - binary classifier
Categorical cross entropy	softmax	softmax regression - multiclass classifier
MSE(mean square error)	Linear(No activation function)	Linear regression

Problem with perceptron

perceptron can’t be fitted on a data which is not linearly separable.

Which means if one line or plane or hyperplane can’t separate your data then we can’t fit perceptron on it

Click Here

For code - Click Here